

1-1 Variables and Expressions

Algebra I

Variable-

Constant

Numerical expression

Algebraic expression

Evaluate

Ex 1: Give two ways to write each algebraic expression in words.

A. $9 + r$

B. $q - 3$

C. $7m$

D. $j \div 6$

Ex 2:

A. John types 62 words per minute. Write an expression for the number of words he types in m minutes.

B. Roberto is 4 years older than Emily, who is y years old. Write an expression for Roberto's age.

C. Joey earns \$5 for each car he washes. Write an expression for the number of cars Joey must wash to earn d dollars.

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Ex 3: Evaluate each expression for $a = 4$, $b = 7$, and $c = 2$.

A. $b - c$

B. ac

Ex 4: Approximately eighty-five 20-ounce plastic bottles must be recycled to produce the fiberfill for a sleeping bag.

A. Write an expression for the number of bottles needed to make s sleeping bags.

B. Find the number of bottles needed to make 20, 50, and 325 sleeping bags.

1-2 Adding and Subtracting Real Numbers Algebra I

Absolute value –

Opposites –

Additive inverse –


▶ Adding Real Numbers

WORDS	NUMBERS
Adding Numbers with the Same Sign If two numbers have the same sign, add their absolute values and use the sign of the numbers.	$3 + 6$ 9
Adding Numbers with Different Signs If two numbers have different signs, find the difference of their absolute values and use the sign of the number with the greater absolute value.	$-2 + (-9)$ -11
	$-8 + 12$ 4
	$3 + (-15)$ -12

▶ Subtracting Real Numbers

WORDS	NUMBERS	ALGEBRA
To subtract a number, add its opposite. Then follow the rules for adding signed numbers.	$3 - 8 = 3 + (-8)$ $8 - 3 = 5$ $ -8 > 3 $ -5	$a - b = a + (-b)$

Ex 1: Add or subtract using a number line.

- A. $-4 + -7$ 
- B. $3 - (-6)$ 

Ex 2: Add.

A. $-\frac{3}{4} + \frac{1}{4}$

B. $y + (-2)$ for $y = -6$

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Ex 3: Subtract.

A. $-6.7 - 4.1$

B. $5 - (-4)$

C. $z - 2\frac{7}{10}$ for $z = 2\frac{3}{5}$

Ex 4: An iceberg extends 75 feet above the sea. The bottom of the iceberg is at an elevation of -247 feet. What is the height of the iceberg?

1-3 Multiplying and Dividing Real Numbers Algebra I

Reciprocal –

Multiplicative inverse –

Multiplying and Dividing Signed Numbers

WORDS	NUMBERS	
Multiplying and Dividing Numbers with the Same Sign		
If two numbers have the same sign, their product or quotient is positive.	$4 \cdot 5 = 20$	$-15 \div (-3) = 5$
Multiplying and Dividing Numbers with Different Signs		
If two numbers have different signs, their product or quotient is negative.	$6(-3) = -18$	$-18 \div 2 = -9$

Properties of Zero

WORDS	NUMBERS	ALGEBRA
Multiplication by Zero The product of any number and 0 is 0.	$\frac{1}{3} \cdot 0 = 0$ $0(-17) = 0$	$a \cdot 0 = 0$ $0 \cdot a = 0$
Zero Divided by a Number The quotient of 0 and any nonzero number is 0.	$\frac{0}{6} = 0$ $0 \div \frac{2}{3} = 0$	$\frac{0}{a} = 0$ $a \neq 0$
Division by Zero Division by 0 is undefined.	$12 \div 0$ Undefined	$a \div 0$ Undefined

Ex 1: Find the value of each expression.

A. $\frac{1}{2}(-10)$

B. $\frac{-48}{-4}$

C. $-3x$ for $x = \frac{2}{3}$

1-3 Algebra I Notes – page 2

Ex 2: Divide.

A. $-\frac{1}{2} \div \left(-\frac{5}{6}\right)$

B. $\frac{8}{9} \div \left(-2\frac{2}{3}\right)$

Ex 3: Multiply or divide if possible.

A. $\frac{0}{15}$

B. $-22 \div 0$

C. $-8.45(0)$

Ex 4: The speed of a hot air balloon is $3\frac{3}{4}$ mi/h. It travels in a straight line for $1\frac{1}{3}$ hours before landing. How many miles away from the liftoff site will the balloon land?

1-4 Powers and Exponents

Algebra I

Power –

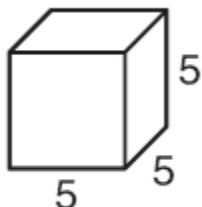
Base –

Exponent –

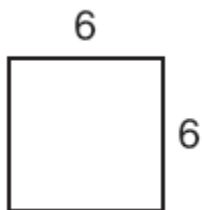
Reading Exponents			
Words	Multiplication	Power	Value
3 to the first power	3	3^1	3
3 to the second power, or 3 squared	$3 \cdot 3$	3^2	9
3 to the third power, or 3 cubed	$3 \cdot 3 \cdot 3$	3^3	27
3 to the fourth power	$3 \cdot 3 \cdot 3 \cdot 3$	3^4	81
3 to the fifth power	$3 \cdot 3 \cdot 3 \cdot 3 \cdot 3$	3^5	243

Ex 1: Write the power represented by each geometric model.

A.



B.



Ex 2: Simplify each expression.

A.

$$(-6)^3$$

B.

$$-10^2$$

C.

$$\left(\frac{2}{9}\right)^2$$

1-4 Algebra I Notes – page 2

Ex 3: Write each number as a power of the given base.

A. 64; base 8

B. 81; base -3

Ex 4: In case of a school closing the PTA president calls 3 families. Each of these families calls 3 other families, and so on. How many families will have been called in the 4th round of calls?

1-5 Square Roots and Real Numbers Algebra I

Square root – a number that is multiplied to itself to form a product is called a square root of that product.

Perfect square – a number whose positive square root is a whole number

Real numbers – a rational or irrational number. Every point on a number line is a real number.

Natural numbers – a counting number; 1, 2, 3, 4, ...

Whole numbers – the set of natural numbers and zero; 0, 1, 2, 3, 4, ...

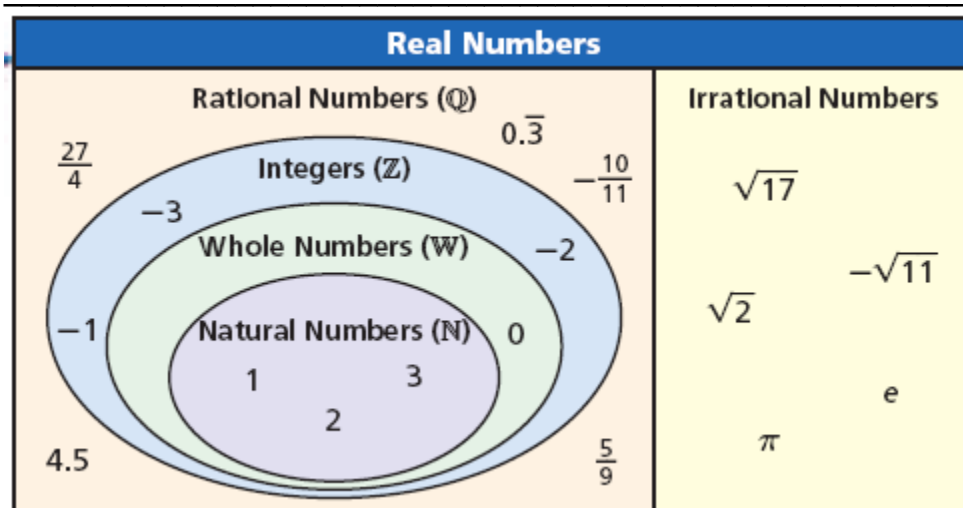
Integers – a member of the set of whole numbers and their opposites

Rational numbers – a number that can be written in the form $\frac{a}{b}$ where a and b are integers and $b \neq 0$.

Terminating decimal – a rational number in decimal form that has a finite number of digits after the decimal point

Repeating decimal – a rational number in decimal form that has a block of one or more digits that repeat continuously.

Irrational numbers – a real number that cannot be expressed as the ratio of two integers. Never repeats or ends.



Ex 1: Find each square root.

A. $\sqrt{16}$

B. $-\sqrt{9}$

C. $\sqrt{\frac{25}{81}}$

1-5 Algebra I Notes – Page 2

Ex 2: As part of her art project, Shonda will need to make a square covered in glitter. Her tube of glitter covers 13 square inches. What is the greatest side length Shonda can have for her square?

Ex 3: Write all classifications that apply to each number.

A. -32

B. 5

1-6 Order of Operations Algebra I

Order of operations –

Order of Operations	
First:	Perform operations inside grouping symbols.
Second:	Simplify powers.
Third:	Perform multiplication and division from left to right.
Fourth:	Perform addition and subtraction from left to right.

Ex 1: Simplify each expression.

A. $15 - 2 * 3 + 1$

B. $12 - 3^2 + 10 \div 2$

C. $2.4 + 4[3^2 - 2(3 - 1.5)]$

Ex 2: Evaluate each expression for the given value of x.

A. $10 - x * 6$ for $x = 3$

B. $4^2(x + 3)$ for $x = -2$

1-6 Algebra I Notes – page 2

Ex 3: Simplify each expression.

A. $\frac{2(-4) + 22}{4^2 - 9}$

B. $3|4^2 + 8 \div 2|$

Ex 4: Translate each word phrase into a numerical or algebraic expression.

A. the sum of the quotient of 12 and -3 and the square root of 25

B. the difference of y and the product of 4 and $\frac{y}{2}$

Ex 5: A shop offers gift-wrapping services at three price levels. The amount of money collected for wrapping gifts on a given day can be found using the expression $2B + 4S + 7D$. On Friday the shop wrapped 10 Basic packages B , 6 Super packages S , and 5 Deluxe packages D . Use the expression to find the amount of money collected for gift-wrapping on Friday.

1-7 Simplifying Expressions Algebra I

Term –

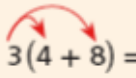
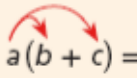
Like terms –

Coefficient –

Properties of Addition and Multiplication

WORDS	NUMBERS	ALGEBRA		
Commutative Property You can add numbers in any order and multiply numbers in any order.	$2 + 7 = 7 + 2$ $3 \cdot 9 = 9 \cdot 3$	$a + b = b + a$ $ab = ba$		
Associative Property When you are only adding or multiplying, you can group any of the numbers together.	$6 + 8 + 2$ $= (6 + 8) + 2$ $= 6 + (8 + 2)$	$7 \cdot 4 \cdot 5$ $= (7 \cdot 4) \cdot 5$ $= 7 \cdot (4 \cdot 5)$	$a + b + c$ $= (a + b) + c$ $= a + (b + c)$	abc $= (ab)c$ $= a(bc)$

Distributive Property

WORDS	NUMBERS	ALGEBRA
You can multiply a number by a sum or multiply by each number in the sum and then add. The result is the same.	 $3(4 + 8) = 3(4) + 3(8)$	 $a(b + c) = ab + ac$

Ex 1: Simplify each expression.

A. $\frac{1}{3}(5)(33)$

B. $45 + 16 + 55 + 4$

Ex 2: Write each product using the Distributive Property. Then simplify.

A. $5(59)$

B. $8(33)$

1-7 Algebra I Notes – page 2

Ex 3: Simplify each expression by combining like terms.

A. $72p - 25p$

B. $\frac{3}{4}x^2 + x^4$

C. $0.5m + 2.5n$

Ex 4: Simplify $14x + 4(2 + x)$. Justify each step with an operation or property.

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1-8 Introduction to Functions

Algebra I

Coordinate plane – a plane that is divided into 4 regions by a horizontal line called the x-axis and a vertical line called the y-axis.

Axes – one of 2 perpendicular number lines called the x-axis and the y-axis, used to define the location of a point in a coordinate plane.

Origin – the intersection of the x- and y-axis in a coordinate plane. The coordinates of the origin are $(0,0)$.

x-axis – the horizontal axis in a coordinate plane.

y-axis – the vertical axis in a coordinate plane.

ordered pair – a pair of numbers (x,y) that can be used to locate points on a coordinate plane.

x-coordinate – the first number in a coordinate pair, which indicates the horizontal distance from the origin in a coordinate plane.

y-coordinate – the second number in a coordinate pair which indicates the vertical distance from the origin in a coordinate plane.

Quadrant – one of the four regions into which the x- and y-axis divide the coordinate plane.

input – a value that is substituted for the independent variable in a relation of a function.

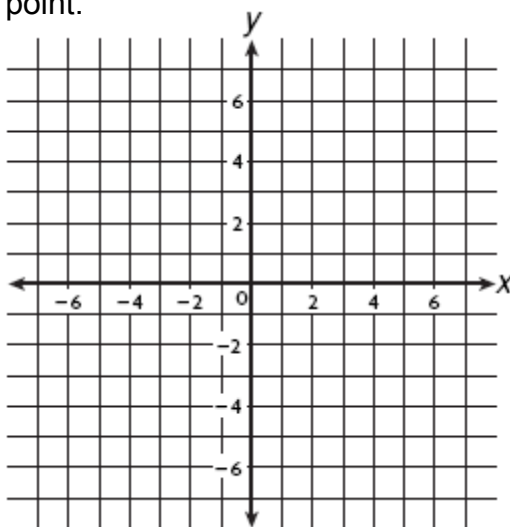
output – the result of substituting a value for a variable in a function.

Ex 1: Graph each point. Label each point.

A. $(-4,4)$

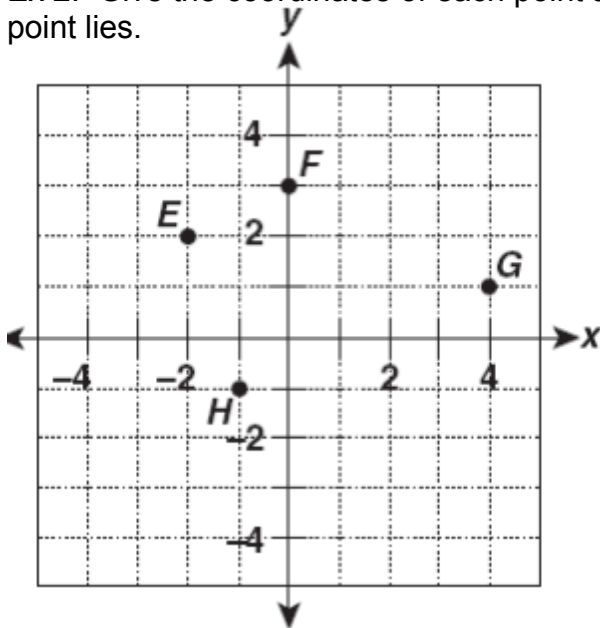
B. $(0,-5)$

C. $(-2,-3)$



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Ex 2: Give the coordinates of each point and name the quadrant in which each point lies.



$$E = (\quad , \quad)$$

$$F = (\quad , \quad)$$

$$G = (\quad , \quad)$$

$$H = (\quad , \quad)$$

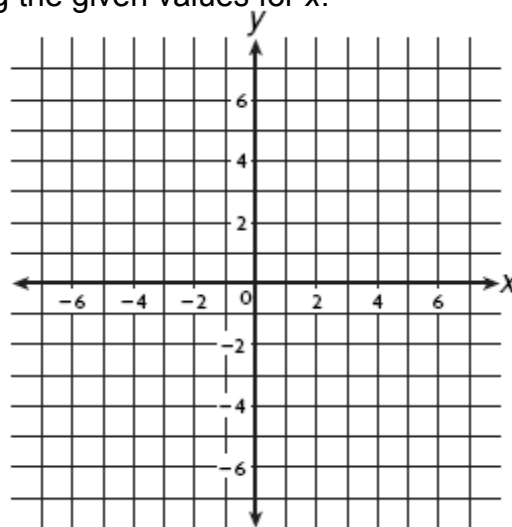
Ex 3: An engraver charges a setup fee of \$10 plus \$2 for every word engraved. Write a rule for the engraver's fee. Write ordered pairs for the engraver's fee when there are 5, 10, 15, and 20 words engraved.

Number of Words Engraved	Rule	Charges	Ordered Pair
X(input)		Y (output)	(x,y)

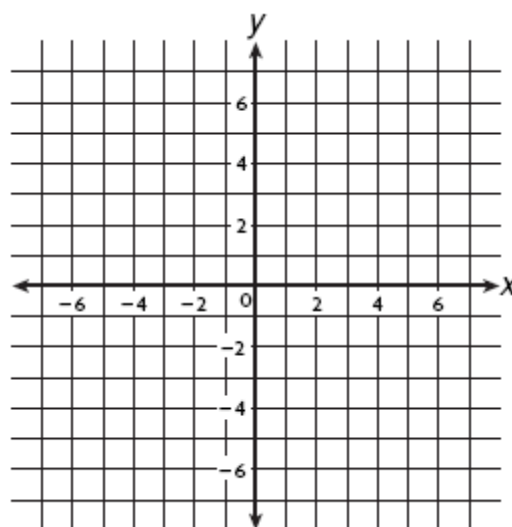
1-8 Algebra I Notes – page 3

Ex 4: Generate ordered pairs for each function using the given values for x .
Graph the ordered pairs and describe the pattern.

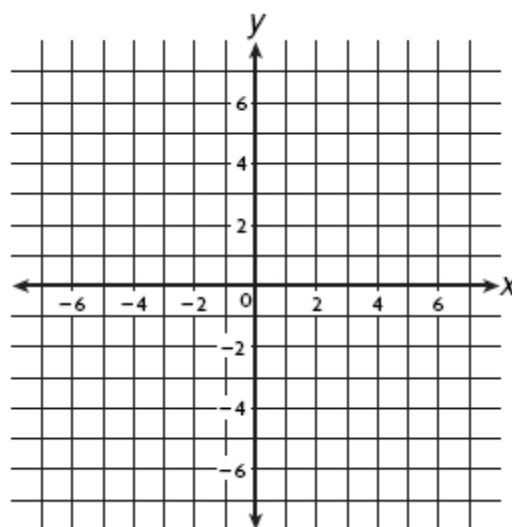
A. $y = 2x + 1$, $x = -2, -1, 0, 1, 2$



B. $y = x^2 - 3$, $x = -2, -1, 0, 1, 2$



C. $y = |x - 2|$, $x = 0, 1, 2, 3, 4$



1-A Measures of Central Tendency (FST 1.3) Algebra I

Statistics utility – graphing calculator with statistics capability or software package.

Measures of center – statistic describing a typical value of a numerical data set; mean, median, mode.

Mean (\bar{x}) - average

Median – the middle number (when the numbers are in order)

***the average of the 2 middle numbers if the data set is even**

Mode – most frequent number

Sigma \sum - symbol standing for the sum.

Summation notation/sigma notation/ \sum -notation – set of numbers written as a sum.

Index – indicates the position of a number in an ordered list.

Measures of central tendency – same as measures of center.

Formula to find the mean in \sum -notation – $\frac{1}{n} \sum_{i=1}^n x_i$

Ex 1: An apartment building has 200 apartments. Let p_i = the number of pets in the i th apartment.

A. What does $\sum_{i=1}^{200} p_i$ represent?

B. Use \sum -notation to express the mean number of pets per apartment.

Ex 2: Let $x_1 = 2$, $x_2 = 4$, $x_3 = 9$, $x_4 = -7$ and $x_5 = 10$
Determine:

A. $\sum_{i=1}^4 x_i =$

B. $\sum_{i=2}^5 x_i =$

C. $\sum_{i=3}^5 x_i - \sum_{i=2}^3 x_i =$

D. Write $2 + 4 + 9 + -7 + 10$

in Σ notation.

1-A Algebra I Notes – page 2

Book ex. 3:

Job	Annual Salary
President	\$250,000
Vice-President	\$100,000
Warehouse Supervisor	\$60,000
Sales Supervisor	\$60,000
Sales Representative NE	\$40,000
Sales Representative NW	\$40,000
Sales Representative SE	\$40,000
Sales Representative SW	\$40,000
Secretary to President	\$25,000
Secretary to Vice-President	\$20,000
Warehouse Worker	\$20,000
Warehouse Worker	\$20,000
Custodian	\$18,000
Custodian	\$16,000
Custodian	\$16,000

A. Rewrite the salary data in a table showing the frequency of each salary

B. Find the mean salary.

C. Find the median salary.

D. Why do you suppose most employees were upset by a newspaper article reporting “Average Wacky Widget worker earns \$51,000”?